Contents

Participants xi

Opening remarks 1
H. MATTHIES

Section I - SYNAPTIC LONG-TERM POTENTIATION

Presynaptic mechanisms in hippocampal long-term potentiation 5
T.V.P. BLISS, M.L. ERRINGTON, K.J. FEASEY, M.A. LYNCH

Long-term potentiation at neocortical level 13
L.L. VORONIN

Synaptic protein phosphorylation and long-term potentiation 25
W.H. GISPEN

Characterization of a 52 kDa phosphoprotein possible related to long-term potentiation 35
P.N.E. DE GRAAN, L.H. SCHRAMA, W.H. GISPEN

Long-term potentiation and intrinsic disinhibition 41
H.L. HAAS

Long-term potentiation in the hippocampal slice: spatial aspects 51
B.P.C. MELCHERS, F.H. LOPES DA SILVA, W.J. WADMAN

Postsynaptic depolarization, a necessary condition for development of LTP? 61
Ø. HVALBY, P. ANDERSEN, J.-C. LACAILLE, G.-Y. HU

Calcium-induced long-term potentiation in the hippocampal CA1 neurons in vitro 67
K.G. REYMANN, R. JORK, K. SCHULZECK, H.K. MATTHIES, R. BRÜDEMANN, H. MATTHIES

Effect of a Ca^{2+} on short-term plasticity of cholinoreceptive membrane in snail neurones 73
A.S. PIVOVAROV, G.N. SAGANELIDZE

Study of proteins in hippocampal slices under long-term potentiation (LTP) 79
T.M. PANKOVA, N.I. MIKICHUR, A.S. RATUSHNYAK, M.V. STAROSTINA, M.B. SHTARK

Effects of noradrenaline on responsiveness and plasticity in hippocampus 83
V.G. SKREBITSKY

Opioid peptides and long-term potentiation in the hippocampus 87
A.N. CHEPKOVA

Post-conditioning long-term potentiation 93
H. MATTHIES, H. RÖTHRICH, T. OTT, R. MATTHIES

Incorporation of ^{3}H-fucose in hippocampal structures after tetanization and conditioning by perforant path stimulation 105
W. POHLE, L. ACOSTA, M. KRUG, H. RÖTHRICH, H.K. MATTHIES, H. MATTHIES

Ultrastructural changes in neurons and synapses of the dentate area accompanying long-term potentiation induced by perforant path stimulation 109
J. WENZEL, M. KRUG, T. OTT, TH.SCHUSTER

Ultrastructural changes of hippocampal neurons and synapses following long-term potentiation - A morphometric study 115
T. SCHUSTER, M. KRUG, M. PLASCHKE, E. SCHULZ, M. WAGNER, J. WENZEL

Loss of conditioning by perforant path stimulation after local microinjection of colchicine in dentate area 119
H. RÖTHRICH,W. DOROCHOV, W. POHLE, H. MATTHIES

Effects of MGO on the field potentials in the dentate gyrus and on conditioning using perforant path stimulation as conditioned stimulus 123
J. BERGADO ROSADO, H. RÖTHRICH, M. KOCH, E. SCHOOF, H. MATTHIES

Different plastic properties of the perforant pathway and commissural input to the dentate gyrus 127
P. MÜLLER-WELDE, M. KRUG, H.K. MATTHIES, H. MATTHIES

Effects of nootropic drugs and antioxidants on cortical long-term potentiation 129
G. KELLER, J. SCHMIDT

Divergent propagation of excitation within the dorsal hippocampus of rabbits - evidence from field potentials evoked by electrical stimulation of the entorhinal input 131
R. SCHLICHTHAAR, H. DALITZ

Section II - HIPPOCAMPAL FUNCTIONS

Restoration of RSA (theta) in the denervated hippocampus by brain transplants 137
G. BUZSÁKI, F.H. GAGE, A. BJÖRKLUND

Organization and modulation of theta-rhythm by the rhythmically bursting septal neurons 141
O.S. VINOGRADOVA, E.S. BRAZHNIK

Effect of electrocoagulation of septum and section of entorhinal cortex on the hippocampal electrical activity and memory in cats 143
T.N. ONIANI, N.G. NACHKEBIA

Effect of memory-influencing drugs on paradoxical sleep 151
W. WETZEL, H. MATTHIES

Effect of paradoxical sleep deprivation on passive avoidance learning in rats 155
M.G. KORIDZE

Multidisciplinary approach to the understanding of hippocampal function(s) in rats genetically selected for differential processing of spatial novelty 159
A.G. SADILE, A. CERBONE

Section III - BIOCHEMISTRY OF MEMORY FORMATION

Obstacles and progress in studying the cell biology of learning and memory 165
S.P.R. ROSE

Testing and extending a sequentially dependent three-stage model of formation of memory 173
M.R. ROSENZWEIG, E.L. BENNETT, T.A. PATTERSON, S.J.Y. MIZUMORI

On the participance of cyclic nucleotides system in the learning modulation 183
R.A. DANILOVA, Ye.V. GUREVICH

Involvement of brain DNA in learning and sleep 189
A. GIUDITTA, F. MORELLI, T. MENNA, C. BUONO, C. PERRONE CAPANO, M.V. AMBROSINI, A. CERBONE, A.G. SADILE

Highly modified poly(A)$^+$ RNA in the cerebral hemispheres of rat and man and its probable role in recording of memory information 195
SU DONGHAI

Strain differences in laboratory rats: Avoidance reactions and total RNA content in the brain cells 203
V. NOVÁKOVÁ, J. ŠTERC

Radiochemical analysis of rat hippocampal RNA after acquisition of a brightness discrimination reaction 207
W. TISCHMEYER, N. POPOV, H. MATTHIES

Water-soluble proteins of snail subesophageal ganglia at early stages of learning 209
L.N. GRINKEVICH, O.G. SAFRONOVA, M.B. SHTARK

Biochemical participation of glycoproteins in memory consolidation after two different training paradigms in goldfish 213
R. SCHMIDT

Impairment of glycoprotein fucosylation in rat hippocampus: Consequences on memory formation 223
R. JORK, G. GRECKSCH, H. MATTHIES

Effects of carbohydrate precursors of glycomacromolecules on retention performance of a learning task in rats 229
N. POPOV, H. MATTHIES

Brain gangliosides: Neuromodulators for synaptic transmission and memory formation 235
H. RAHMANN

A functional role of ganglioside GM1 in synaptic transmission and synaptic plasticity of the rat hippocampus 247
W. SEIFERT, M. HOLLMANN, A. WIERASZKO

Alterations in rat brain glycomacromolecules after administration of methylglucamine orotate 255
P. AMEZAGA ACOSTA, N. POPOV, H. MATTHIES

Kindling and free radicals: A new direction in the search for mechanisms 257
J. SCHMIDT

Section IV - PRINCIPLES AND MODIFICATION OF LEARNING BEHAVIOR

Memory and imprinting 265
G. HORN

Neuropharmacology of associative learning in bees 273
R. MENZEL, B. MICHELSEN

Conditioned taste aversion: brain stem substrate for learning without awareness 277
J. BUREŠ, O. BUREŠOVÁ

Locus coeruleus in learning and memory retrieval 283
S. SARA, M. SEGAL

An autoradiographic analysis of neural pathways involved in memory processes using radioactive 2-Deoxyglucose 289
C. DESTRADE, J. SIF, M. GAUTHIER, D. GALEY, T. DURKIN, A. CALAS

Defeat-induced analgesia and the conditioned display of submissive postures and escape in strains of mice 295
B. SIEGFRIED, P. KUELLING, P.G. WASER, H.R. FRISCHKNECHT

Multiple and correlative approach to the understanding of behavioural habituation to spatial novelty in the albino rat 299
A. CERBONE, A. CRIMALDI, G. MANZI, A.G. SADILE

Individual differences in neuronal plasticity by abnormal organism-environment relationships 303
J. OEHLER, H.-E. SCHUMACHER, M. JÄHKEL, J. SCHMIDT

Hormone - transmitter interactions in memory modulation 305
J.L. McGAUGH, K.C. LIANG, I.B. INTROINI

Memory enhancement with posttraining glucose injections: possible involvement in epinephrine modulation of memory storage 307
P. GOLD, J.L. HALL

Changes in cerebral biogenic amine metabolism during passive avoidance behaviour in mice 315
A.J. DUNN, K.L. ELFVIN, C.W. BERRIDGE

The learning and exploratory behaviour of rats with deprivation catecholaminergic brain systems activity induced by 6-OH-DA 325
E.A. GROMOVA, T.P. SEMYONOVA

On the participation of monoaminergic systems of the brain in the mechanisms of the effect of neuropeptides on the processes of learning and memory 329
R.I. KRUGLIKOV, V.M. GETSOVA, N.V. ORLOVA, O.Kh. KOSHTOYANTS, M.YU. MARKAROVA, T.N. RIGA

The use of conditioned rotation in the hemi-dopamine rat to study the biochemistry of learning and memory 333
R.J. CAREY

Trimethyltin (TMT) - induced forebrain lesions, cognitive impairment, and ß-adrenergic receptor binding 337
R.B. MESSING, C.A. COHEN, S.B. SPARBER

Influence of a modulation of neurotransmitter systems on memory retrieval 341
G. GRECKSCH, H.-L. RÜTHRICH, H. MATTHIES

The role of acetylcholine and catecholamines in the memory processes in the newborn rat 343
J. MYSLIVEČEK

Participation of cholinergic mechanisms in the memory effects of CNS stimulants 347
D.I. YONKOV

Unilateral vibrissae removal induces changes in the crossed nigrostriatal projection of the rat 351
J.P. HUSTON, H. STEINER, S. MORGAN, K.W. LANGE

Role of ß-endorphin and other mechanisms in the simultaneous and consecutive processing of new and old memories 357
I. IZQUIERDO, C.A. NETTO, F. CHAVES, J. QUILLFELDT, A. GIANLUPI, B. OLIVEIRA

Behavioral performance of rats and the content of vasopressin and oxytocin in distinct brain areas 369
A. ERMISCH, R. LANDGRAF, P. MÖBIUS, H. PETTER

Enkephalins are hormonal modulators of learning and memory 373
J.L. MARTINEZ

Do casomorphin peptides influence consolidation processes? 375
G. GRECKSCH, CH. SCHWEIGERT, R. RODRIGUEZ, H. MATTHIES

Effects of cholecystokinin octapeptides and their fragments on the acquisition and extinction of active avoidance behaviour of rats 381
M. FEKETE, B. PENKE, M. FEKETE-SZÁNTÓ, G. TELEGDY

The effect of trazodone and its metabolite, CCP, on acquisition of conditioned avoidance response 383
J. VETULANI, M. SANSONE

Anxiogenic and memory-enhancing effects of drugs acting at the GABA-benzodiazepine receptor complex 387
P. VENAULT, L. PRADO DE CARVALHO, J. ROSSIER, G. CHAPOUTHIER

The effect of chronic ethanol administration on neurotransmitter metabolism in rat brain: modification by carnitine and gamma linolenic acid 391
R. CORBETT, B.E. LEONARD

Bromopyruvate, a pyruvatehydrogenase inhibitor, induces memory impairments and changes in hippocampal oxidative metabolism in rats 397
L. FRÜLICH, M. LAUTERBACH, S. HOYER

How are the events at the molecular and neuronal levels connected with learning and memory? 401
L. PICKENHAIN

INDEX 407